SERVICE MANUAL

SANYO

FILE NO A-4899

Multi-gas Incubator.

MCO-175M
(N_2-O_2-CO_2 Control).

Specification changed version

Specification change : June 1996

—SUMMARY—

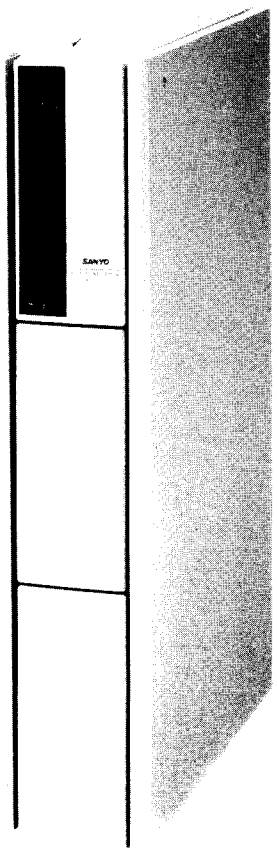
Chopper type infrared sensor, which was used in Multi gas incubator MCO-175M, was changed chopperless type infrared sensor.

With this change, the control P.C.B. has control circuit for chopperless type infrared sensor is adopted.

Performance specification does not change due to this change.

This service manual is specification changed version based on Service manual MCO-175M SM-720053 has been issued.

Temperature: Room temperature + 5 to 50℃
CO_2 density: 0 to 20%
O_2 density : 2 to 18%
22 to 70%



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Features

This unit has infrared CO_2 sensor which can control CO_2 density at high accuracy and could not be affected by humidity. It is possible to show high reliability and high accuracy, because this Sensor does not have any driving parts.

Contents of Specification changed

- Introduction of new type CO_2 sensor.
- P.C.B. has been changed because new type CO_2 sensor is not compatible with former type one in the aspect of circuit.
- New type CO_2 sensor is distinguished from former one as follows.

	CO_2 sensor	P.C.B.
Former type	Stamped SANYO on the case	Silk printed 7FB-4-B101-005-00 on P.C.B. board*
New type	Stamped 17AI on the case	Silk printed 7FB-4-B101-034-00 on P.C.B. board*

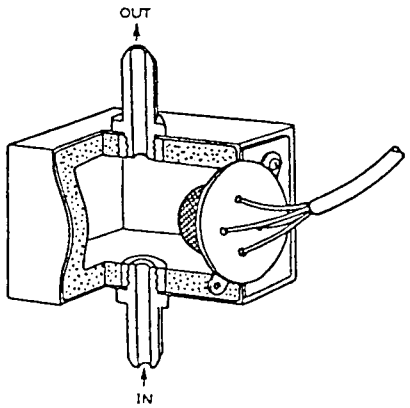
〈Note〉 Code mnber with * mark is parts code of the bare board.
This number is not parts code of P.C.B. assembly.

- The products since Ser.No.607×××××has been changed.
- Refer to page 16 as to the required parts to repair.

Electric parts

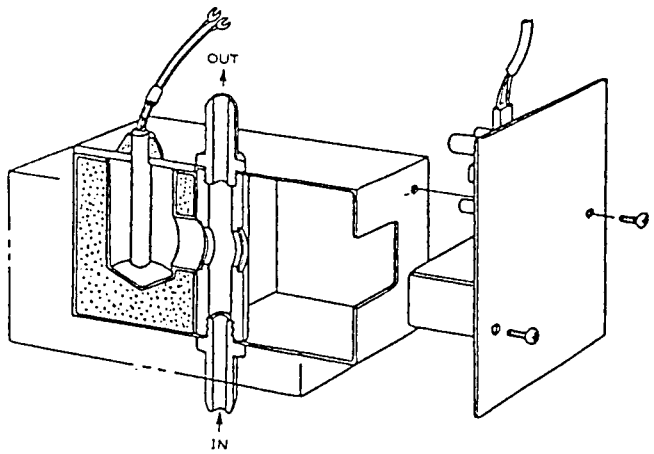
Part Name	Standard and Specification	Function
CO_2 sensor	IR (infrared) light gas sensor Applied voltage : Circuit DC±15V Light source DC5V Operation range : -10～+75℃ Using range : 0～+60℃	To measure the density of CO_2.
O_2 sensor	Zirconia solid shell FCX-MW Applied voltage : DC5V±0.2V 0.7A Measuring range : 2～18%,22～70%	To measure the density of O_2.
Temperature sensor	Thermistor sensor 103AT-1 (25℃, 10KΩ)	To control the internal temperature.
Overheat protection sensor	Thermistor sensor 103AT-1 (25℃, 10KΩ)	To prevent the internal temperature abnormal rising.
CO_2 sensor box sonsor	Thermistor sensor 103AT-1 (25℃, 10KΩ)	To control the temperature inside of the CO_2 sensor box
Thermal fuse in CO_2 sensor box.	Melting point: 70℃	To prevent the temperature inside of the CO_2 sensor box abnormal rising.
Water level sensor	SUS-304	To measure the water level in water jacket.
Pump	AP-1500(RE)	To feed the sampling gas to sensors.
Fan motor	FL2-011YM	To circulate the chamber air
Power transformer	ATR-K23 AC8.5V AC18V	For control P.C.B.
Main heater	Rate:AC100V, 103W (98Ω)	To heat the main chamber.
Door heater	Rate: AC100V, 132W (76Ω)	To heat the main chamber additionally and to prevent the glass door condensing.
Gasket heater	Rate: AC100V, 59W (169Ω)	To prevent the gasket condensig.
CO_2 heater A	Rate: AC 61V (Series), 19.5W (190Ω)	To heat CO_2 sensor box.
CO_2 heater B	Rate: AC 39V (Series), 12.5W (121Ω)	
Buzzer	PKB 8-4AO DC12V,13mA	For alarm.
Solenoid valve	PCS-241A-M5 DC24V,2W	For O_2/N_2 gas.
Solenoid valve	SS-22H-M5DIL	For CO_2 gas.
Noise filter	ZCB2203-11(TDK) AC240V,3A	To prevent miss feeding by line noise.
Switching power supply	RS-8-5 DC5V,3A,15W	To supply O_2 sensor, CO_2 sensor light source and control P.C.B. with the power.
Door switch	V-013-1A3(OMURON) AC125V,0.1A	To check the door is closed or opened.

Specification of O_2 sensor



· Principle of measuring :
  Zirconia solid-state electrolytic type.
· Measuring range : 0-95%
· Using range : 2-18% O_2, 22-70% O_2
· Power supply : DC5V±0.2V
· Ambient temperature : 45℃ (PID controlled)

Specification of CO_2 sensor



· Principle of measuring :
  Infrared optical sensor type.
· Applied voltage : Circuit DC±15V
  : Light source DC5V
· Ambient temperature : 45℃ (PID controlled)

Alarm, Safety Functions and Self diagnostic functions

This unit has alarm and saftey functions and self diagnostic functions as fallows.

Table of Alarm and Safety function

	Situation	Indication	Buzzer	Safety operation
Upper limit temperature alarm	If the temperature inside the unit exceeds the upper limit alarm temperature set value.	The upper limit temperature alarm indicator lamp will light and E09 or E12 will appear on the temperature indicator.	Intermittent tone	Heater OFF.
Automatic set temperature alarm	If the internal temperature deviates from the temperature by ±1℃ or more	All digits on temperature indicator will flash.	An intermittent tone will be emitted after a delay of 15 min.	
Automatic set CO_2 density alarm	If the internal CO_2 density deviates from the set value by ±1% or more.	All digits on the CO_2 density indicator will flash.	An intermittent tone will be emitted after a delay of 15 min.	
Auto return	If a key operation is not performed for about 90sec. in each setting mode.	Normal display mode.	—	The setting mode will be cancelled
Key lock switch	When the key lock switch is turned ON.	—	—	Key inputs will disabled.
Automatic calibration function	Normally, the zero point of the CO_2 sensor are calibrated every 4 hours or so (every 10min. for the first hour after the power is switched ON), using the atmosphere as the gas to be calibrated.	The decimal point(period) of the CO_2 density indicator will flash.	—	
Empty CO_2 gas cylinder	If the CO_2 density does not increase when the CO_2 valve is open.	E01 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	
Temperature sensor abnormality	If the temperature sensor is open circuit or short circuit.	E05 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	Heater OFF
CO_2 sensor abnormality	If the output voltage of the CO_2 sensor is abnormal	E06 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	The CO_2 valve will be closed.
Temperature sensor of the CO_2 sensor is abnormal.	If the temperature sensor of CO_2 sensor is open circuit or short circuit.	E08 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	Sensor box heater OFF.
Main heater abnormality	If the upper limit temperature alarm operates, or if the main heater is open circuit or if the main heater SSR is short circuit.	E09 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	
Bottom heater abnormality	If the bottom heater is open circuit or if the bottom heater SSR is short circuit.	E10 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	
CO_2 sensor heater abnormality	If the CO_2 sensor heater is open circuit or the CO_2 sensor SSR is short circuit.	E11 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	
Heater SSR open circuit	If the SSR of the main heater, door heater or CO_2 sensor heater is open circuit.	E12 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	
Operation of sampling gas pump or auto zero pump is faluty.	If the sampling gas pump or auto gas pump does not operate.	E13 will be displayed alternately with the temperature on the temperature indicator.	Intermittent tone	The CO_2 valve will be closed.

* The remote alarm is interlocked with the buzzer. The buzzer tone resulting from the upper limit temperature alarm can not be stopped with the BUZZER key.
* E01 will be cleared automatically when the gas is connected correctly and the buzzer silenced with the BUZZER key.

■ Self-diagnostic function／How to judge error code(E××).

When detected the trouble by self-diagnostic function, the following error codes and temperature will be displayed alternately.

"E 0 1" – Empty CO_2 gas
It is activated if the rising of CO_2 density is less than 0.2(%CO_2/min) when opened CO_2 valve.

"E 0 2" – Empty O_2/N_2 gas
It is activated if the changing speed of O_2 density is less than 0.2%O_2/min(V1.04) or less than 0.1%O_2/min(V1.05),when the O_2/N_2 valve is open
E02 indication, Valve auto-change operation,
LED of empty gas cylinder is flashing.

"E 0 3" – Wrong connection with CO_2 gas cylinder
It is activated if CO_2 density is rising more than 1.0(%CO_2/min) even when CO_2 valve is closed. There is a possibility that O_2/N_2 valve is connected with CO_2 gas cylinder.
CO_2 valve and O_2/N_2 valve are OFF.

"E 0 4" – Wrong $O_2 \longleftrightarrow N_2$ gas feeding
It is activated when O_2 density is set less than 18.0%O_2, if the O_2 density is rising more than +0.7(%O_2/min) and over 23%O_2 after opened O_2/N_2 valve.
CO_2 valve and O_2/N_2 valve are OFF.
It is supposed that although N_2 gas has to be fed, O_2 gas is been feeding.

By contraries, it is activated when O_2 density is set more than 22%O_2, if O_2 density is falling more than -0.7(%O_2/min) and below 17%O_2 after opened O_2/N_2 valve.
CO_2 valve and O_2/N_2 valve are OFF.
It is supposed that although O_2 gas has to be fed, N_2 gas is been feeding.

"E 0 5" – Temperature sonser goes short circuit or open circuit
It is activated if the value that converted the resistance of temperature sensor into temperature is more than 60℃ or less than 0℃.
Main heater, door heater and gasket heater are OFF.

"E 0 6" – Abnormality of CO_2 sensor input voltage
It is activated if the A/D converter input voltage of CO_2 sensor output is less than 1000mV or more than 4500mV.
CO_2 valve is OFF.

"E 0 7" – Abnormality of O_2 sensor input voltage
It is activated if the A/D converter input voltage of O_2 sensor output is less than 3mV or more than 3000mV.
O_2 valve is OFF.

"E 0 8" – Abnormality of sensor box temperature sensor
It is activated if the value that converted the resistance of sensor box temperature sensor into temperature is more than 60℃ or less than 0℃.
Sensor box heater is OFF.

"E 0 9" – Main heater goes open circuit or SSR for main heater goes short circuit.

"E 1 0" – Door heater and gasket heater go open circuit or SSR for door heater goes short circuit
(Besides, door and gasket open simultaneously.)

"E 1 1" – Heater for sensor box goes open circuit or SSR for sensor box heater goes short circuit

"E 1 2" – Any SSRs for heater goes open circuit

"E 1 3" – Abnormality of auto calibration
It is activated if differential between the sensor output voltage immediately before auto calibration is carried out and the sensor output voltage when feeding air is less than 150mV, when CO_2 set value is more than 3.5%CO_2 and CO_2 displayed value is more than 3.5%CO_2.
It ignores the values calculated by CO_2 autozero adjustment and O_2 autospan adjustment.
It is supposed that pipes for gas sampling and for auto calibration is broken, or defective air pump.

Alarm buzzer sounds (intermittent tone) synchronized with error code.
Press the buzzer key to stop the buzzer.
Remote alarm contact is interlocked with the alarm buzzer. If turn the alarm buzzer off, the remote alarm contact turns also off.
Even if the buzzer key is not pressed, error codes(except E03 and E04) are released when normal conditions are checked through the following steps.
E03 and E04 are self-kept until pressed the buzzer key.

Timing of check :

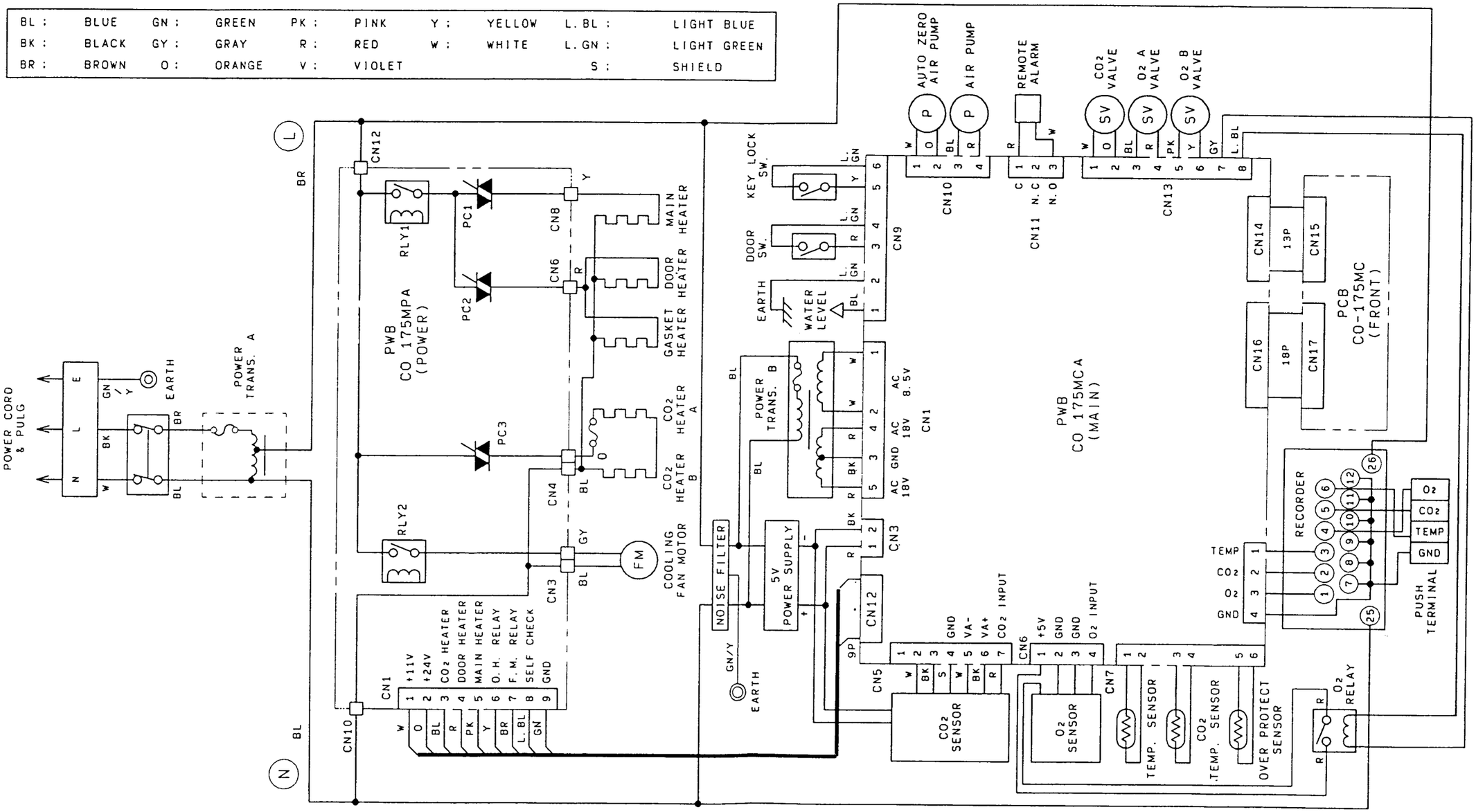
E01 - E04 : Check every minutes. When same conditions continues three times, error code could be decided. Accordingly, it takes 3 minutes to decide the error code, and 1 minutes to release automatically.

E05 - E08 : Check every 0.5 seconds. But it needs several seconds to decide the error code due to the delay of filter.

E09 - E12 : Check every 4 minutes. When same conditions continues two times, error code could be decided. Accordingly, it takes 8 minutes to decide the error code, and 4 minutes to release automatically.

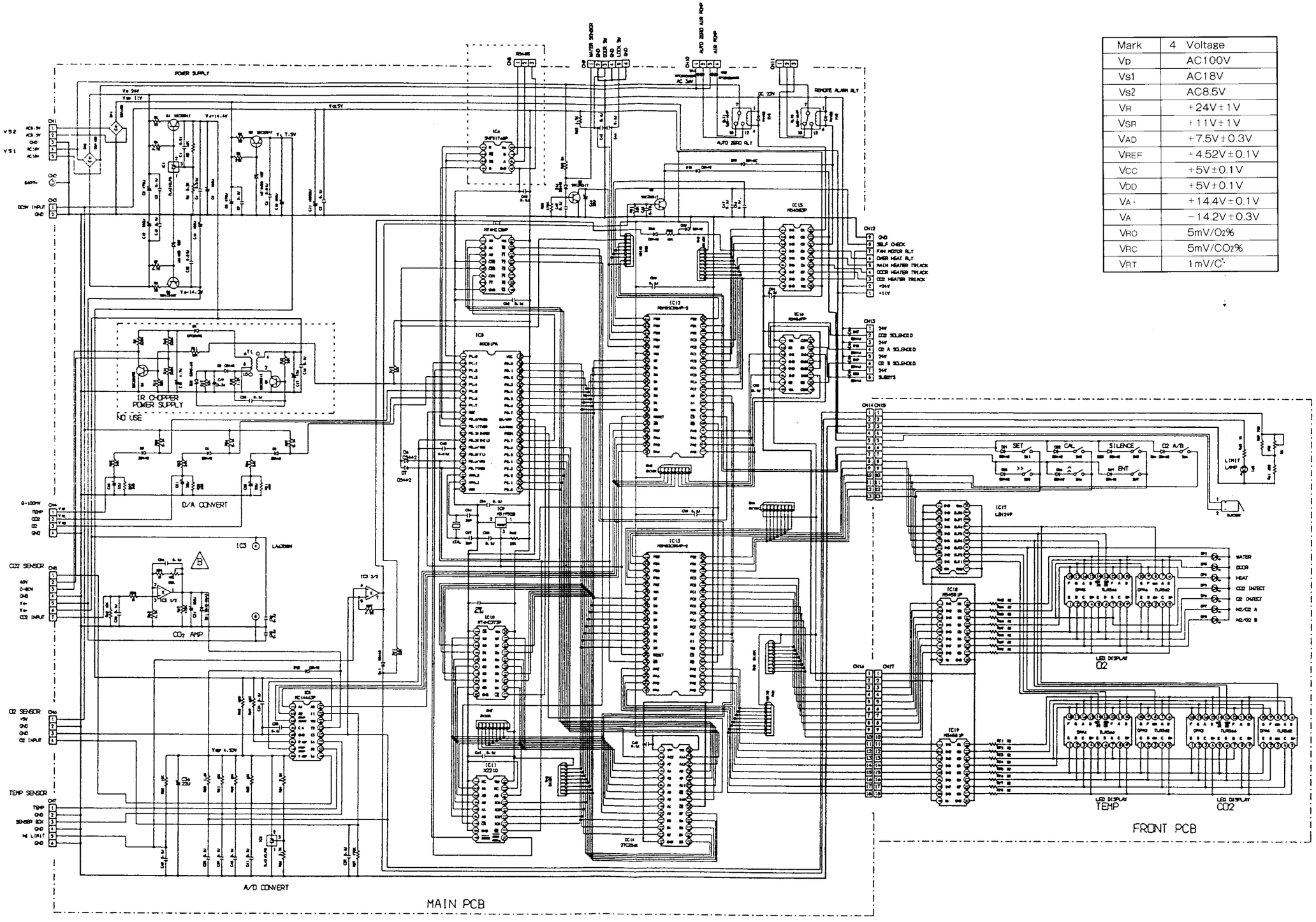
E13 Check only when the auto calibration is carried out. Accordingly, it could not be decided and auto-released until auto calibration is carried out.

Auto calibration functions(CO_2 autozero adjustment/O_2 autospan adjustment)
Auto calibration operates for 4 minutes every 10 minutes in first 1 hour after the temperature of sensor box temperature control sensor reached within 45±1℃ since powered the unit on. But after this first 1 hour, it operates every 4 hours.
Auto calibration takes two minutes to feed ambient air and more two minutes to reset the sensor. Total time is 4 minutes.


BL : BLUE GN : GREEN PK : PINK Y : YELLOW L.BL : LIGHT BLUE
BK : BLACK GY : GRAY R : RED W : WHITE L.GN : LIGHT GREEN
BR : BROWN O : ORANGE V : VIOLET S : SHIELD
POWER CORD & PULG
EARTH
POWER TRANS. A
PWB CO 175MPA (POWER)
RLY1
RLY2
PC1
PC2
PC3
CN12
CN8
CN6
CN4
CN3
MAIN HEATER
DOOR HEATER
GASKET HEATER
CO2 HEATER A
CO2 HEATER B
COOLING FAN MOTOR
FM
CN1
+11V
+24V
CO2 HEATER
DOOR HEATER
MAIN HEATER
O.H. RELAY
F.M. RELAY
SELF CHECK
GND
CN10
KEY LOCK SW.
DOOR SW.
EARTH
WATER LEVEL
CN9
POWER TRANS. B
CN1
AC 18V
AC GND
AC 8.5V
NOISE FILTER
5V POWER SUPPLY
CN3
CN12
9P
CN5
CO2 SENSOR
CN6
+5V
GND
GND
O2 INPUT
CO2 INPUT
VA+
VA-
GND
CN7
TEMP. SENSOR
CO2 TEMP. SENSOR
OVER PROTECT SENSOR
O2 RELAY
AUTO ZERO AIR PUMP
AIR PUMP
REMOTE ALARM
CO2 VALVE
O2 A VALVE
O2 B VALVE
CN10
CN11 N.C N.O
CN13
PWB CO 175MCA (MAIN)
CN14
13P
CN15
CN16
18P
CN17
PCB CO-175MC (FRONT)
RECORDER
TEMP
CO2
O2
GND
PUSH TERMINAL
O2
CO2
TEMP
GND

Circuit diagram

Mark	4 Voltage
Vp	AC100V
Vs1	AC18V
Vs2	AC8.5V
VR	+24V±1V
VSR	+11V±1V
VAD	+7.5V±0.3V
VREF	+4.52V±0.1V
Vcc	+5V±0.1V
VDD	+5V±0.1V
VA-	+14.4V±0.1V
VA	−14.2V±0.3V
VRO	5mV/O2%
VRC	5mV/CO2%
VRT	1mV/C°



Special function mode

Function mode (Temp. indicator)	Output data indicator	Functions
F 0 0	CO_2 indicator	To indicate ROM version number.
F 0 1	CO_2 indicator	To set ouput ratios of door heater and gasket heater.
F 0 2	CO_2 indicator	To calibrate temperature analog output.
F 0 3	CO_2 indicator	To caliarate CO_2 analog output.
F 0 4	CO_2 indicator	To calibrate O_2 analog output.
F 0 5	CO_2/O_2 indicator	To indicate output voltage of CO_2 sensor or one of O_2 sensor.
F 0 6	—	To initialize non-volatile memories. (Do not use)
F 0 7	All indication flashing	To check all LED and driver operation.
F 0 8	CO_2 indicator	Memory switch.
F 0 9	CO_2 indicator	To indicate CO_2 sensor box temperature.

(NOTE) F06 should not be used.

The indication of O_2 sensor output voltage in F05 displays a valid value after more than four minutes have elapsed since the O_2 density was set.

It is possible to check and change all functions or all sections by using these special function modes.

■ Operation method

(1) Press the CAL key for about 5 seconds.
(2) The top digit of the temperature indicator will flash and the other indicators will go out.
(3) Set the top digit to [F] with the ▲ key.
(4) Set the remaining digits to the desired function numer with the ▲ and ▶▶ keys.
(5) Confirm that there are no errors, then press the ENT key.

Auto zero function

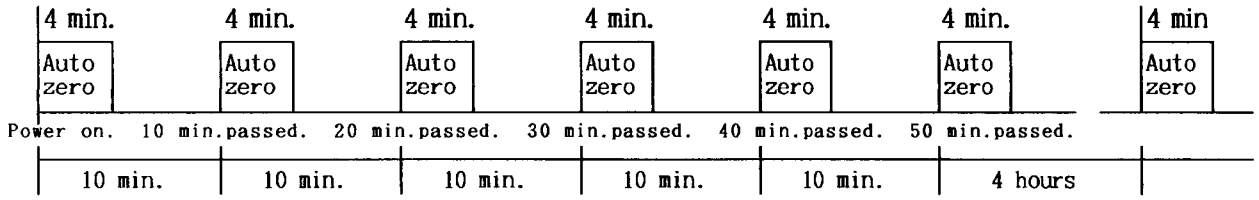
This unit uses the infrared CO_2 sensor and it has to be adjusted sometimes. Auto zero function operates every 4 hours, but in the first one hour after the unit started, this function operates every 10 minites (total 6 times). (Refer to the following timing chart.)

(1) Mechanism of auto zero adjustment.

- Operate the auto zero pump for 2 minutes to feed ambient air to CO_2 sensor. During this period, the sampling air pump will be turned off. Because CO_2 density is almost 0%(0.03%～0.07%) and O_2 density is almost 20% in ambient air, adjust automatically that the measured CO_2 is 0% and the measured O_2 density is 20%.

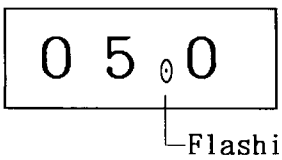
- Then operate the sampling air pump for 2 minutes to compare the ambient CO_2 density and O_2 density with the internal CO_2 density and O_2 density. During this period, the auto zero air pump will be turned off.

(2) Cycle of auto zero adjustment.



(3) Indication of auto zero adjustment

During the auto zero adjustment, indicators of CO_2 density and O_2 density are locked as those densities were displayed on those indicators immediate before the auto zero adjustment, the decimal point of those indicators are flashing. It is possible to change the set values of CO_2 density and O_2 density during auto zero adjustment.

CO_2 indicator 

〈Note〉 When the set value of CO_2 density is 0% and that of O_2 density is 18.1～21.9 %, those indicators does not displayed, so the decimal point also couldn't be seen.

(4) Auto zero adjusting method.

Auto zero adjustment is performd by adding a quater of difference between each measurements so as not to change the density rapidly.

For example : 0.0% ⟶ (4 hours) 1.0%(CO_2 density) ···The added value is 0.25%.

(5) Auto zero adjustment OFF setting.

Auto zero adjustment is set OFF by special function mode F08.
In case that auto zero adjustment does not be set, you should observe

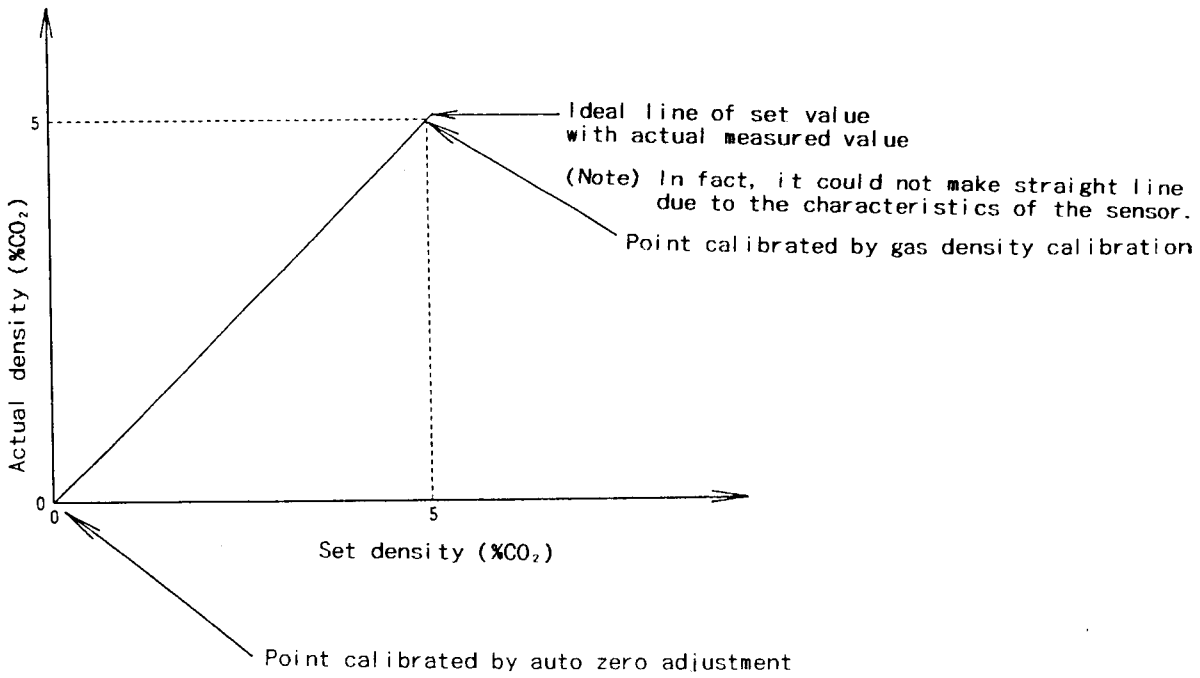
Explanation on gas density calibration and autozero adjustment.

MCO-175M has two adjustment, one is manual gas density calibration, another is autozero adjustment.

1. Gas density calibration
   If there is a differential between internal density set value or displayed value and actual measured value, calibrate gas density and enter actual measured value again.
   As far the procedure, refer to Page 15-16 of Service manual MCO-175M SM720053.

2. Auto zero adjustment
   Refer to Page 12 of this manual.

3. Operations of two adjustments.
   The relationship between two adjustments is shown in figure below.
   (EX－CO_2 density : 5%CO_2)


5
0
0
5
Actual density (%CO2)
Set density (%CO2)
Ideal line of set value with actual measured value
(Note) In fact, it could not make straight line due to the characteristics of the sensor.
Point calibrated by gas density calibration
Point calibrated by auto zero adjustment

The specifications of CO_2 sensor and main P.C.B have changed since the production (from S/No.607×××× onward) of July in 1996.

Please follow the following directions in case of servicing.

Even if you order only either a CO_2 sensor(624 182 3774) or a main P.C.B. (624 182 2401), a set (624 205 8700) of new type CO_2 sensor and main P.C.B. will be supplied.

1. In case of replacing an old type CO_2 sensor,
   ⟶ Replace both new type CO_2 sensor and new type main P.C.B.
2. In case of replacing an old type main P.C.B.,
   ⟶ Replace both new type CO_2 sensor and new type main P.C.B.
3. In case of the unit which has already new type CO_2 sensor and new type main P.C.B., (the unit from S/No.607×××× onward or the unit has replaced them once at the service.)
   ⟶ There is no problem either CO_2 sensor or main P.C.B. is replaced. In this case, it is not necessary to return a part not used.

In all above cases, both CO_2 zero adjustment and span adjustment should be performed after parts replaced as usual.

Besides, the specificatoin of the product does not change due to changing of the specificatin of these parts.

[Zero adjustment method]

(1) After replaced both CO_2 sensor and main P.C.B., run the unit for warming up.
Check the internal temperature of the sensor box by function mode F09.
The acceptable range is 45±1℃.

(2) In case that internal CO_2 density is 0%,
① Set the function mode F05 and press the ENT key.
② Output of the CO_2 sensor (unit : V) will be indicated on CO_2 display.
③ Turn VR1 on main P.C.B. by using small screw driver to set 4.0 V of output voltage at 0%.
④ After adjusted, press the ENT key to return to the normal display mode.

(3) In case that internal CO_2 density is not 0%,
① Set the function mode F05 and press the ENT key.
② Press the ENT key again to return the present inside temperature display mode.
Within 60 second, auto zero operation will start.
(Auto zero air pump operates for about two (2) mins.)
③ Again set the funcion mode F05 and press the ENT key.
④ Output of the CO_2 sensor (unit : V) will be indicated on CO_2 display.
⑤ Turn VR1 on main P.C.B. by using small screw driver to set 4.0 V of output voltage at 0%.
⑥ After adjusted, press the ENT key to return to the normal display mode.

[Span adjustment method]

(1) Set the CO_2 density. Wait till the indication is stable fully.
(2) Press the CAL key for about five (5) sec.
(3) The highest digit on temperature indication will be flashing.
Other digits will go out.
(4) Press the CAL key again.
(5) The highest digit on CO_2 indication will be flashing.
Other digits will go out.
(6) Input the actual internal density and press the ENT key.
(7) Return to the normal display mode automatically.

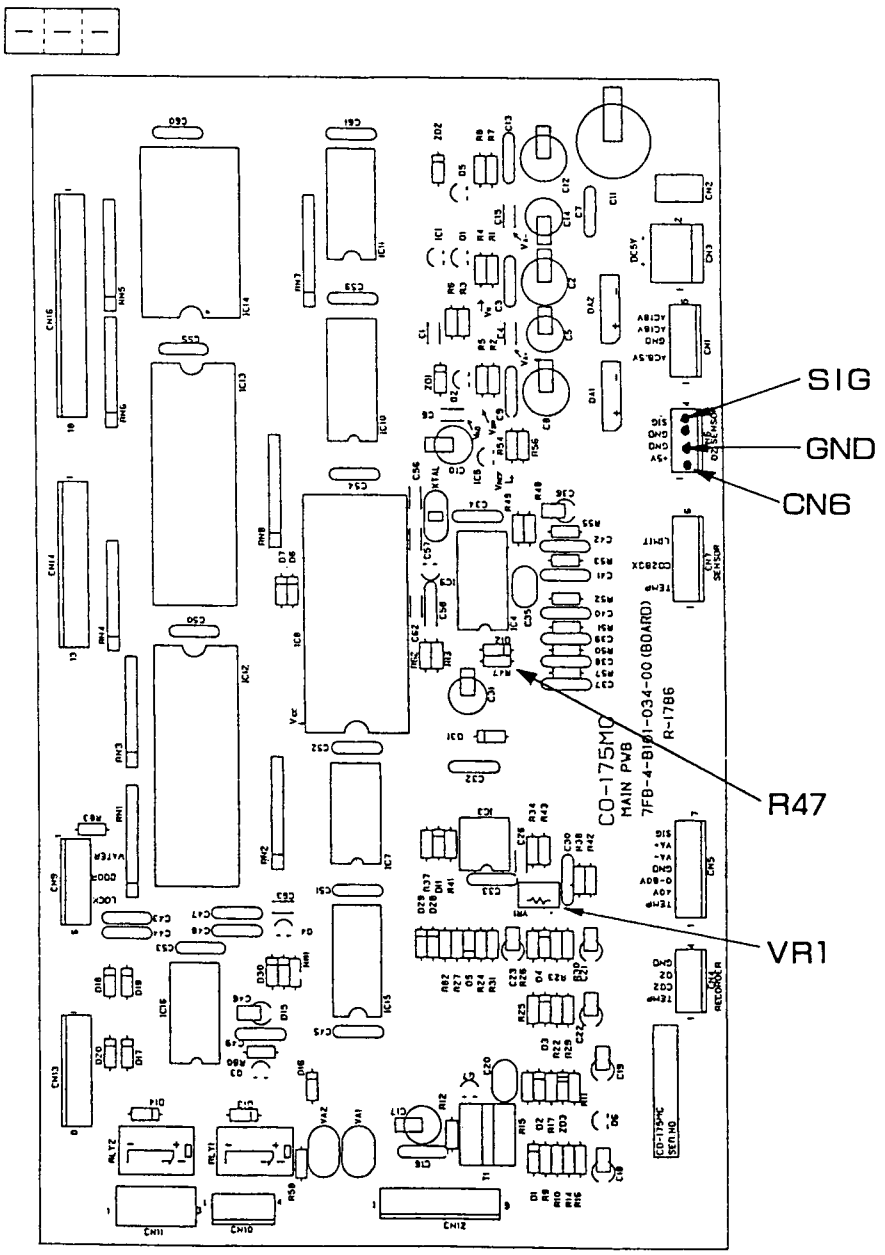
How to measure the output voltages of CO_2 sensor and O_2 sensor

To measure A/D converter input voltage(V) of CO_2 sensor output and that (mV) of O_2 sensor output, use Function mode F05 as mentioned above.
The following methods also measure these A/D converter input voltages.

① A/D converter input voltage (V) of CO_2 sensor output.
Voltages in both ends of R47 on the main P.C.B. as mentioned above.

② A/D converter input voltage (mV) of O_2 sensor output.
Between #2 (GND) and #4 (SIG) of CN6 on the main P.C.B.

〈Note〉 When measure the voltage of O_2 sensor, confirm that O_2 sensor is under operation.
What is O_2 sensor is under operation is in the following condition.
1. The temperature of sensor box is stable.
2. O_2 sensor is not during warming up.
O_2 indication when O_2 sensor is warming up is as follows.



Fault-finding chart

Fault	Cause	Check point
● Poor temperature control	Defective temperature sensor. E05 indication.	● Temperature sensor goes open circuit or short circuit.
	Main heater trouble. E09 indication.	● Measure the resistance of main heater.
		● Defective power board.
	Inside fan does not rotate.	● Fan motor.
		● Falling out of fan.
		● Door switch operation.
	Under overheat protection operation.	● Set value of overheat protection.
		● Overheat protection sensor
● Condensation on inner door	Poor sealing of inner door gasket. Poor sealing of outer door gasket.	● If gasket has no trouble, adjust using Function mode F01. In this case, if getting larger the input number, condensation on inner door could be reduced, but condensation inside the chamber may be increased. Therefore you must do adjustment carefully while watching the situation.

Fault	Cause	Check point
● Poor CO_2 density control ○ Internal gas density is low	Empty gas cylinder. E01 indication.	● Residual quantity in gas cylinder. ● Gas supplying pressure. ● Air pump for gas circulation operation.
○ Internal gas density is high	Defective air pump for gas circulation. Defective autozero pump.	● Air pump, power supply.
	Gas circulation blocking.	● Crushing of the piping. ● Drops inside piping. ● Dirty interior of filter. ● Condensation inside filter and containing water. ● Clogging of glass capillary tube.
	Air going into gas circulation.	● Broken piping. ● Crack of filter case. ● Loose connector of CO_2 sensor and O_2 sensor. ● Falling out or pinching of O_2 sensor and O ring.
	Leakage from CO_2 electromagnetic valve.	● Leakage from electromagnetic valve.
	Wrong gas connection. E03 indication.	● Connecting point of gas.
○ Density fluctuates widely	Half blocking of gas circulation.	● Drops inside piping. ● Air going into gas circulation
	Defective CO_2 sensor.	● Output voltage of CO_2 sensor ● Temperature control of sensor box.

Fault	Cause	Check point
● Poor O_2 density control ○ No feeding gas into the chamber When O_2 density is set lower, O_2 density does not decrease. When O_2 density is set higher, O_2 density does not increase.	Empty gas cylinder. E02 indication.	● Residual quantity in gas cylinder. ● Gas supplying pressure. ● Air pump for gas circulation operation. ● Relashion of conncetion port A/B with electromagnetic valve A/B using.
○ Gas feeding into the chamber is too much.	Defective air pumu for gas circulation.	● Crushing of the piping. ● Drops inside piping.
	Gas circulation blocking.	● Dirty interior of filter. ● Condensation inside filter and containing water. ● Clogging of glass capillary tube.
	Air going into gas circulation	● Broken piping. ● Crack of filter case. ● Loose connector of CO_2 sensor and O_2 sensor. ● Falling out or pinching of O_2 sensor and O ring.
	Leakage from O_2/N_2 electromagnetic valve.	● Leakage from electromagnetic valve.
○ Density fluctuates widely	Half blocking of gas circulation.	● Drops inside piping. ● Air going into gas circulation
	Defective O2 sensor.	● Output voltage of O_2 sensor ● Temperature control of sensor box.

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承認	審査	校閲

SERVICE MANUAL (貿易)

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登録者：岡村

機種名	備考
MCO-175M Spec. change	新規発行

配布先：

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品質保証部	1部 2部
三洋電機サービス(株)	1部 20部(技術業務課20部)

改訂日	改訂者	理由

適用機種名	製品コード	電圧(V)	周波数(HZ)
MCO-175M	S23-238-51	220V	50
	S23- -52	220V	50/60
	S23- -53	240V	50
	S23- -54	110V	60
	S23- -55	230V	50
	S23- -56	115V	60
	S23- -57	115V	60
	S23- -58	220V	50/60
	S23- -59	220	50

適用機種名	製品コード	電圧(V)	周波数(HZ)
	S23- -		
	S23- -		
	S23- -		
	S23- -		
	S23- -		
	S23- -		
	S23- -		
	S23- -		
	S23- -		